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Contourite drift off Madeira Island (Northeast Atlantic) and implications to Cenozoic bottom-current circulation

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During the last decades several works have been carried out on the morphosedimentary processes driven by bottom-currents in several continental margins and abyssal plains worldwide. However these processes still remain poorly understood on deep-water settings and particularly around oceanic islands. This study is focused on the offshore of Madeira Island (Portugal), which is located in the Northeast Atlantic at about 700 km west of NW Africa. The interpretation of a newly acquired dataset, composed of multibeam bathymetry, Parasound echosounder profiles and multichannel seismic reflection profiles, allowed to identify a giant (about 385 km long and over than 175 km wide) plastered contourite drift, called the “Madeira Drift”, developing along the lower slope of the Madeira plateau. It formed on top of a major erosional unconformity that truncates the underlying pelagic deposits, which drape over faulted blocks of Cretaceous oceanic crust. The Madeira Drift is composed of three main regional seismic units showing a predominant aggradational stacking pattern, without evidence of major lateral migration thought time. Its internal configuration indicates that it was build-up by a northwards flowing deep bottom current. These characteristics suggests that an almost persistent and stable water mass has been responsible for its edification trough time. While the precise age of this contourite drift is undetermined, some chronostratigraphic constraints can be determined based upon published works regarding seafloor magnetic anomalies (e.g. Bird et al., 2007), DSDP Site 136drilling data (Hayes et al., 1978). Attending to this, we propose that the possible onset of Madeira Drift must have occurred after Late Cretaceous, within the tertiary period, and quite probably in the Late Eocene / Eocene-Oligocene transition. Based on them is commonly accepted that an enhanced proto-Antarctic Bottom Water (AABW) started to circulate at that time we considered this water mass as the best candidate for the build-up of Madeira Drift. Thus, the Madeira drift represents an exceptional sedimentary record in this sector of the Northeast Atlantic for the earliest phases of the proto-AABW water mass circulation.

References:

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